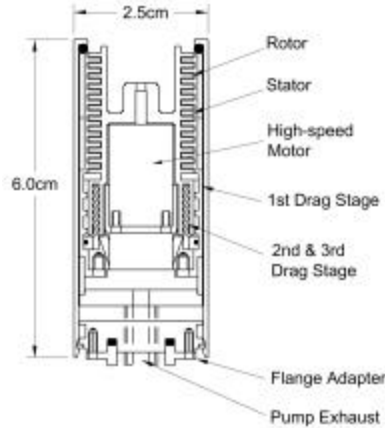


## BRIEFING CHART

NASA SBIR/STTR Technologies  Extremely Miniaturized, Turbomolecular Pump -Based Vacuum System PI: Marc Kenton, PhD/Creare Incorporated, Hanover, NH Proposal No.: 01-19.02 9841	
<p><u>Description and Objectives:</u></p> <p>Creare proposes to develop two versions of an extremely miniaturized high vacuum system to support miniature analytical instruments such as mass spectrometers (MS). One version will be optimized for use on a Mars lander and the other for Earth applications. The heart of both systems will be a hybrid turbomolecular/molecular drag pump (TMP/MDP) that is about the size of a C-cell flashlight battery. By contrast, the smallest commercially-available TMP is over a factor of 40 larger in volume. The work plan heavily leverages analytical tools, fabrication techniques, and specialized facilities from a previous NASA-funded Creare project that developed what was until now the world's smallest TMP.</p>	
<p><u>Approach:</u></p> <p>Phase I successfully demonstrated the operation of all key components of the TMP/MDP; indeed, rapid progress allowed two tasks originally planned for Phase II to also be completed. During Phase II, the pump components will be optimized in terms of both raw performance as well as manufacturability at reasonable cost. In addition, the pump will be tested under conditions of high vibration and shock to qualify it for harsh environments that normally preclude the use of TMPs. Finally, the pump will be mated with a modified version of a miniature COTS roughing pump for use in Earth applications.</p> <p><u>Subcontractors/Partners:</u></p> <p>Alcatel, one of the world's largest vacuum pump vendors, will contribute specialized manufacturing expertise to ensure that the pump can be manufactured commercially at a reasonable cost. They have indicated their strong interest in licensing this technology if it proves successful.</p>	<p><u>Schedule and Deliverables:</u></p> <p>By the end of the project, we will deliver the miniature TMP/MDP, a similar TMP without an integral MDP section, and a closed-loop, programmable vacuum pump controller. We will also deliver a modified COTS rough pump suitable for use with the TMP/MDP in Earth applications. Reports documenting the design of these devices and the various test results will also be supplied.</p> <p><u>NASA &amp; Commercial Applications:</u></p> <p>This technology will allow NASA to deploy miniature analytical instruments previously developed in its laboratories on spacecraft and for portable terrestrial applications. Commercial applications on Earth focus on portable gas analysis equipment, especially MS. Such systems are a powerful tool for pollution monitoring, process control, and forensic investigations. Two particularly attractive commercial products would be truly hand-held residual gas analyzers and helium leak detectors. The military is greatly interested in deploying portable MS for detection of chemical and biological warfare agents.</p>